A paper was communicated to the Society, entitled, "Experimental Researches on Electricity, Third Series," by Michael Faraday, Esq. D.C.L. F.R.S. M.R.I., the reading of which was deferred to the next Meeting.

The Society then adjourned over the Christmas Vacation, to meet again on the 10th of January.

January 10, 1833.

JOHN WILLIAM LUBBOCK, Esq. M.A., V.P. and Treasurer, in the Chair.

The reading of Mr. Faraday's paper, communicated at the last Meeting, and entitled, "Experimental Researches on Electricity, Third Series," was commenced.

January 17, 1833.

MARK ISAMBARD BRUNEL, Esq., Vice-President, in the Chair.

The reading of Mr. Faraday's paper was resumed and concluded.

The object of the inquiries of which an account is given in the present paper, is to establish the identity of the electricities derived from different sources. The author was induced to investigate this subject, because doubts have been frequently expressed as to the accuracy of some experiments from which the identity of common and voltaic electricities is inferred: and distinctions have been drawn between them, as if they were different forms and modifications of one common power. In order to examine the question in all its bearings, he arranges the phenomena under two general heads; namely, those arising from electricity in a state of equilibrium, or *tension*, as it has been called; and those which are the consequence of its *motion*, when that equilibrium has been destroyed. The visible effects of electricity of tension are attractions or repulsions at sensible distances; those of electricity in motion are the evolution of heat, the production of magnetism, chemical decompositions, physiological changes, and, lastly, the evolution of light in the form of a spark. The author proves, by experiments, that every one of these phænomena takes place from the operation either of ordinary or of voltaic electricity; the degree in which they are produced depending on the different circumstances of quantity, of intensity, and of velocity, attendant on the different modes in which electricity has been excited and supplied. Thus no difference was found to exist in the mode in which a Leyden battery charged with ordinary electricity, and a voltaic battery, were discharged, when the comparison was made by means of fine points, nicely arranged and approximated, either through air of the ordinary temperature, or through heated air, such as the flame of a spirit-lamp, interposed between the points.

By the term *current*, the author designates any progressive change, of whatever nature it may be, in the electric state, whether consisting

in the motion of one electric fluid in a particular direction, or of two fluids in contrary directions: and by the term *arrangement*, he understands a local adjustment of particles, or fluids, or forces, not progressive.

By *ordinary electricity*, he understands that which can be obtained from the common electrical machine, or from the atmosphere, or by pressure, or cleavage of crystals, or similar mechanical operations; its character being that of great intensity, and the exertion of attractive and repulsive forces, not merely at small but also at considerable distances. The parallel between voltaic and ordinary electricity is then pursued by the production of evidence that those attractions and repulsions, which were thought to characterize the latter, are exhibited also by the former; and that, on the other hand, ordinary electricity, when in motion, gives rise to an increase of temperature, to magnetic phenomena, to chemical decompositions, to physiological impressions, and to luminous appearances, precisely of the same kind as those which had been supposed to be the peculiar effects of voltaic electricity. The experiments of Mr. Colladon, which seemed to show that a stream of common electricity has power to produce the deflexion of a magnet,—a conclusion which has hitherto rested on the single testimony of that experimentalist,—have been repeated and extended by Mr. Faraday, who completely confirms their accuracy, and the truth of the result that had been obtained from them. The author succeeded in making common electricity assume more of the characters of voltaic electricity, by availing himself of the retarding power of bad conductors interposed in the electric circuit. In this way he easily succeeded in obtaining the same decisive evidence of chemical action by common electricity as Dr. Wollaston had done in his experiment. But Mr. Faraday considers the experiment in which water is decomposed by this power, as affording no proof of electro-chemical agency; because, as Dr. Wollaston had pointed out, both oxygen and hydrogen are evolved at each of the points of the interrupted circuit, and not separately at the respective poles. The author regards the amount of electro-chemical decomposition as being proportional, not to the *intensity*, but to the *quantity* of electricity transmitted. It is not effected by electricity passed from the machine in sparks, although these tend to decompose water into its constituent elements. Some experiments of Bonijol on the decomposition of water by atmospherical electricity, are commented on by the author, who considers them as analogous to the experiment of Dr. Wollaston already referred to. Mr. Faraday also makes some remarks upon Mr. Barry's paper in the Philosophical Transactions for 1831, and suggests doubts of the soundness of the inferences he draws from his experiments.

The author then proceeds to examine the electrical phenomena elicited by magneto-electricity, and shows that, as far as they have been observed, they coincide with those of voltaic electricity, and, consequently, are referrible to the same agency. The only effects that have not been yet obtained are chemical decompositions. The quantities of thermo-electricity that can be elicited in ordinary cases are

too small to produce any effects but those of magnetism, and also muscular contractions in the limbs of frogs. The animal electricity of the torpedo produces most of the effects of voltaic electricity, excepting the evolution of heat and light. The general conclusion deduced by the author from these researches is, that electricity, whatever be its source, is perfectly identical in its nature.

In the concluding chapter of the present paper, the author endeavours to establish some relation by measure between common and voltaic electricity. He shows, by experiment, that whenever the same *absolute quantity* of electricity, whatever be its *intensity*, passes through the galvanometer, the deflecting force exerted upon the magnetic needle is invariably the same. Hence this deflecting force may be taken as the measure of the absolute quantity of transmitted electricity; a principle which establishes the value of the galvanometer as an instrument of measurement in all cases of electricity in motion. The power of chemical decomposition he finds to be also directly as the quantity of transmitted electricity.

January 24, 1833.

The Rev. WILLIAM BUCKLAND, D.D., Vice-President, in the Chair.

A paper was read, entitled, "Magnetical Experiments, made principally in the South of Europe and Asia Minor, during the years 1827 and 1832." By the Rev. George Fisher, M.A. F.R.S.

This paper is divided into five sections. The first gives an account of a series of experiments made with a view to determine the relative intensities of the forces soliciting a horizontal magnetic needle, and also the forces in the direction of the dipping needle, at London, Lisbon, and Gibraltar; premising a minute description of the apparatus employed, and a circumstantial statement of the methods used for conducting the investigation.

The second section gives the details and results of similar experiments made at London, Malta, Syracuse, Catania, Messina, Naples, Baia, Constantinople, Egina, and Athens; and also on the plain of Troy, and at Vourla in Asia Minor.

The third section contains an account of experiments on the diurnal variation in the intensity of the magnetic force soliciting a horizontal needle in the island of Malta.

In the fourth section, experiments are related on the diurnal variation of the magnetic needle suspended horizontally at Malta.

The fifth section is occupied by an account of the results of similar experiments made on the bases and edges of the craters of Vesuvius and Ætna; and also on Gibraltar rock, and the neutral ground below: from which it appears, that the forces soliciting both the horizontal needle and that in the position of the dip, were considerably greater on the elevated than on the lower situations.

From the whole of the observations made in different parts of the Mediterranean, and contained in this paper, it appears that great